The author's numerous figures and statistics provide a valuable source for others who may study the problems of time series. We are indebted to him for reminding us of their importance and more or less forcing us to think about a difficult subject that is perhaps more comfortable, but most unwise, to neglect.

DISCUSSION BY MICHAEL A. WALTERS

This treatise by John McGuinness represents an entire approach to the problem of reflecting trend in insurance ratemaking. Following a methodical definition of terms and statement of the difficulties involved, he develops his thesis as to where the solution lies and provides valuable procedures for the practical implementation of that solution. In short, if his thesis proves acceptable, he has given us a rather complete answer to the question of trend.

His thesis basically is as follows. The importance of trend requires the establishment of a method that is actuarially precise, uses a maximum amount of information, is applicable to all lines, and reflects cyclical movements to some extent while at the same time providing stability and removing arbitrary judgment. The current method of reflecting trend apparently is unsatisfactory according to these criteria; and so he has established a method that does qualify, using several techniques of statisticians such as the theory of runs, statistical control charts, and unbiased index numbers.

He defines "trend" as long-term movement, thereby requiring a large number of years to measure it accurately. Hence, the current shorter term method seems doomed at the outset, although the author later recognizes the need to reflect cyclical movements and major irregular fluctuations. Fundamentally, however, his concern is for the long-range growth of pure premiums, excluding the cycles and waves that temporarily mask the ultimate trend.

His "proof" of the stability of long-term estimates consists of projecting the short-term estimates for more years than they are meant to be projected and comparing them with the long-term projection of long-term data. This seems to beg the question as to which method more accurately predicts the insurance results of the immediate future, given the experience of the immediate past coupled with some knowledge of the patterns of movement.

research and inclusion of definitions are noteworthy, as are his comments on the nature and quality of trend data and on the length of projection. Especially enlightening are the sections on property coverages, where the use of Fisher's Ideal Index Number is shown to produce meaningful results by combining several diverse groups of catastrophe-laden data.

With regard to the techniques involved in compiling the statistical control charts, the calculation of index numbers is rather lengthy but could be done by computer, as could the formulation of the equation of the trend line. If the guide lines are selected to be a "standard error" perpendicular distance from the trend line so as to contain a certain percentage of the data points, then the method of cyclical adjustment will have to be revised because of the disparity between the vertical and the perpendicular distance from the guide lines to the trend line.

There is also a possibility that changes and improvements in data could render ten years an impractical length of time for maintaining uniform data. These changes can be relatively indepedent of the control of the ratemaker, such as revisions in financial responsibility limits, changes in coverage, and refinements of the experience period to accident half-years, or even accident quarters.

The several areas Mr. McGuinness suggests for further inquiry are potentially rewarding, but as priority over these one might pursue ways of improving the present trend technique, such as: seasonal adjustments, employment of more recent data by means of more refined computer techniques, reflection of claim frequency trend to supplement average claim cost trend, and possible use of external data to support the judgment of the ratemaker if sufficient correlation can be shown in the past between the insurance data and the external data.

Mr. McGuinness has written an educational and thought-provoking paper. His technique of analyzing long-term trends in liability and property insurance is basically sound and can give the ratemaker a broad perspective of what has occurred in the past. Perhaps some version of his methodology that is versatile enough to fully and promptly recognize the costly and sometimes not-so-short-lived cycles in insurance will be the most effective solution to the problem of trend.